

6/23/98

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SUBJ: IMPLEMENTATION OF TECHNICAL STANDARD ORDERS (TSO) FOR PARTS

1. PURPOSE. This notice establishes the Aircraft Certification Service (AIR) plan to implement TSO's for parts, TSO-C148 Aircraft Mechanical Fasteners, TSO-C149 Aircraft Bearings, and TSO-C150 Aircraft Seals. These TSO's will provide a method for fastener, bearing, and seal manufacturers to produce parts under an Federal Aviation Administration (FAA) approved production system. This notice contains TSO procedural differences and eligibility criteria, and addresses concerns on the installation of TSO approved parts. The parts TSO's should not be used for standard parts or for critical parts.

2. DISTRIBUTION. This notice is distributed to the branch level in the Aircraft Certification Service and the Flight Standards Service; to the branch level in the Aircraft Certification Directorate Offices and the Regional Flight Standards Divisions; to the Federal Aviation Administration Academy and the Regulatory Support Division; to all Flight Standards District Offices; International Field Offices; International Area Offices; Aircraft Certification Offices; and Manufacturing Inspection District and Satellite Offices.

3. BACKGROUND.

a. Development of the parts TSO's was prompted by a Federal Register notice, Replacement and Modification Parts; Enhanced Enforcement (60 FR 10480 February 27, 1995) that enforces compliance with 14 CFR §21.303. This section requires that no person may produce a modification or replacement part for sale for installation on a type certificated product unless it is produced pursuant to a Parts Manufacturer Approval (PMA). Exceptions are provided for parts produced under a type or production certificate (TC or PC) or a TSO authorization, parts produced by an aircraft owner or operator, and standard parts. The enhanced enforcement notice required that all aircraft part manufacturers comply with §21.303 by submitting preliminary parts manufacturer application to the appropriate geographic aircraft certification directorate no later than May 30, 1995.

b. The Aviation Rulemaking Advisory Committee (ARAC) on Aircraft Certification Procedures, Parts Working Group was tasked to provide a definition for a "standard part." The definition would be specifically identified in the 14 CFR part 21 and would include design standards provided certain criteria are met. During the process of establishing a definition of a standard part, difficulty arose with regard to specialized fasteners, seals, and bearings manufactured to specifications which are known only to the manufacturer. The specifications are not freely distributed for anyone to make and, therefore, such parts do not meet the criteria for a standard part. These parts are represented by thousands of part numbers to

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account for various diameters, thickness, lengths, etc. and installed on multiple type certificated products in multiple locations. Parts Manufacturer Approval is not practical due to the burden which PMA application paperwork would create for the FAA and manufacturers. A small group of fastener, bearing, and seal manufacturers, working under the authority of the ARAC Parts Working Group, developed and recommended that the FAA issue TSO-C148, Aircraft Fasteners, TSO-C149, Aircraft Bearings, and TSO-C150, Aircraft Seals. These TSO's provide fastener, bearing, and seal manufacturers a workable method to obtain FAA approvals to produce their parts.

c. The Aircraft Engineering Division, AIR-100, issued TSO-C148 on September 26, 1997, and TSO-C149 and TSO-C150 on April 24, 1998.

d. Technical standard orders may later be developed for other types of parts.

4. PROCEDURAL DIFFERENCES FROM OTHER TSO's.

a. Articles approved under a TSO must meet a minimum performance standard. Appendix 1 of the parts TSO's specifies performance property test requirements. In the fastener TSO tensile, shear, torque, fatigue and preload are the performance properties. The values for these properties vary with the fastener design properties of material, dimensions, and heat treat. Shear strength, for example, varies with the fasteners metallurgy and heat treat. Parts manufactured to the same size may have widely different performance characteristics. Based on sample testing, the part manufacturer states the actual minimum performance values for each part size in its application for TSO authorization.

b. The article is a series of parts of a particular design and type, defined by the parts manufacturer rather than a specific model of equipment.

c. Appendix 1 of the parts TSO's references an array of military, American Society for Testing and Materials, and/or American National Standards Institute documents rather than a single, for example, RTCA Inc. or SAE document. A provision is made to use the revision of the documents (or successor documents) in effect on the date of TSO application, if acceptable to the FAA. For practicality, it is not necessary for each ACO to maintain a copy of the documents, however, they must be readily available to the FAA at the manufacturer's facility.

d. Fasteners, bearings, and seals are normally produced in lots. The inspection lot numbers and material lot or certification numbers are important data requirements for the purpose of traceability.

e. For practical reasons, such as not enough surface area, all of the TSO marking information is not required to be marked on each individual part, but must be on each package or container of parts. In all cases the marking must be acceptable to the FAA.

5. ELIGIBILITY CRITERIA FOR PARTS TSO AUTHORIZATIONS. The Aircraft certification Offices (ACO) may apply the following criteria to determine if a part series/model is eligible for a TSO authorization:

- a. The part series/model is not a standard part under 14 CFR §21.303 (b)(4). A standard part example is a bolt that meets a Military Standard (MS) or a National Aerospace Standard (NAS);
- b. The part series/model may have installation application on multiple type certificated products, and;
- c. The part series/model is specialized to the manufacturer, normally of a catalog or catalog derivative type, manufactured to the part manufacturers standard procedures. The part may also be of a proprietary design.

NOTE: Guidance on limiting approvals to parts that are not used in critical applications is provided in paragraph 6.b(4).

6. INSTALLATION OF TSO APPROVED PARTS. A TSOA of itself does not confer installation approval. Two parts of the same size that meet a parts TSO can have widely different performance characteristics. This is reinforced by the last item in paragraph 5c of the parts TSO's, which requires the parts manufacturer to send a note with the parts manufactured under the TSO's. For example, the note in the fasteners TSO makes the following statement: "The parts contained in this shipment have been manufactured and inspected in accordance with TSO-C148. The conditions and tests required for TSO approval of this article are minimum performance standards. Aircraft fasteners approved under this TSO are not necessarily interchangeable with other aircraft fasteners approved under this TSO. Fasteners of similar dimensional properties may have widely varying performance and metallurgical properties. Substitution of parts may only be done if acceptable to or approved by the Administrator." As for all TSO approved articles, the methods available for installation of these articles are:

- a. Verification that the fastener, bearing, or seal has previously been approved as part of a product's type design through the use of the type certificate holder's maintenance instructions, illustrated parts catalogues, or company maintenance/overhaul manuals, or;

- b. Parts substitution (substitution of one part's design for another) approved in a manner acceptable to the FAA through:

- (1) Part number traceability back to the TC holder's approved design using drawings, purchase orders, or other relevant documentation. Information to this effect may be provided by the TSO authorization holder, however, it is the responsibility of the installer to determine if this documentation is acceptable;

- (2) A supplemental type certificate;

- (3) An FAA Form 8110-3, or;

(4) A field approval for a major alteration or a major repair (FAA Form 337). Use of parts by the aviation maintenance community must be approved in accordance with Federal Aviation Regulations. The approvals should not be granted for parts that are used in critical applications and, therefore, should be limited to parts where their failure would not affect safe flight and landing of the aircraft. Examples of parts used in critical applications are:

(a) Life limited bolts that need analytical or empirical substantiation beyond that provided by the fastener manufacturer.

(b) Seals that have an inspection interval or a related procedure specified in a product's airworthiness limitations or instructions for continued airworthiness.

(c) Main shaft engine bearings, wheel bearings, or miniature precision bearings for gyroscopic instruments installed (**as a single installation**) in aircraft intended for operation under instrument flight rules.

(5) The design of substitute fasteners may be evaluated using MIL-HNBK-5, Military Standardization Handbook, Metallic Materials and Elements for Aerospace Vehicle Structures, as a guide. The design of substitute bearings and seals may be evaluated by using the type certification procedures as used for the original design/installation.

7. ACTION.

a. Manufacturing Inspection Offices in conjunction with Manufacturing Inspection District Offices (MIDO) and Manufacturing Inspection Satellite Offices (MISO) shall notify the fastener, seals, and bearing manufacturers that they may apply for TSO authorizations.

b. The ACO's, MIDO's, and MISO's shall process parts TSO applications and accomplish certificate management in accordance with 14 CFR subpart O, Order 8150.1, Technical Standard Order Procedures, and the guidance in this notice.

c. The Aircraft Engineering Division will inform ACO's of the current acceptable revision level for test documents specified in Appendix 1 of parts TSO.

d. The ACO's shall notify AIR-100 of any significant trends, resulting from granting deviations to fastener, bearing, or seal manufacturers, that would warrant changing the property test requirements in the parts TSO's. Accordingly, AIR-100 will initiate appropriate changes to the TSO's as needed.

e. Additional technical standard orders may be developed by AIR-100 for other types of parts.

f. The guidance contained in this notice will be included in the next revision to Order 8150.1, Technical Standard Order Procedures.

signed by:

James C. Jones

Manager, Aircraft Engineering Division